NOAA Techniques Development Laboratory
Computer Program NWS TDL CP 94-3

AFOS TERMINAL AERODROME FORECAST ENCODING

Silver Spring, Md.
June 1994

U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service

PREFACE

The Techniques Development Laboratory's (TDL's) computer program (CP) series is a subset of TDL's technical memorandum series. The CP series documents computer programs written at TDL primarily for the Automation of Field Operations and Services (AFOS) computers.

The format for the series follows that given in the AFOS Handbook 5, Reference Handbook, Volume 6: Applications Programs, Part 1: Policy and Procedures, published by the Office of Technical Services/AFOS Operations Division.

NOAA Techniques Development Laboratory
Computer Program NWS TDL

CP 83-1 Gross Sectional Analysis of Wind Speed and Richardson Number. Gilhousen, Kemper, and Vercelli, May 1983. (PB83-205062)
CP 83-2 Simulation of Spilled Oil Behavior in Bays and Coastal Waters. Hess, October 1983. (PB84-122597)
CP 83-3 AFOS-Era Forecast Verification. Heffernan, Newton, and Miller, October 1983. (PB84-129303)
CP 83-4 AFOS Monitoring of Terminal Forecasts. Vercelli, December 1983. (PB84-145697LL)
CP 83-5 Generalized Exponential Markov (GEM) Updating Procedure for AFOS. Herrmann, December 1983. (PB84-154822LL)
CP 84-1 AFOS Display of MDR Data on Local Map Background. Newton, July 1984. (PB84-220797)
CP 84-2 AFOS Surface Observation Decoding. Perrotti, September 1984. (PB85-137586)
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CP 85-2 AFOS Terminal Forecast Decoding. Vercelli, Norman, and Heffernan, October 1985. (PB86-147360LL)
CP 85-3 AFOS-Era Forecast Verification. Ruth, Miller, and Heffernan, October 1985. (PB86-148319LL)
CP 87-1 AFOS Terminal Aerodrome Forecast Formatting. Wantz and Eggers, July 1987. (PB88-10449LL)
CP 87-2 AFOS-Era Forecast Verification. Ruth and Alex, July 1987. (PB88-125570LL)
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CP 87-4 AFOS Monitoring of MDR Data Using Flash Flood Guidance. Norman and Newton, October 1987. (PB88-137450LL)
CP 87-5 AFOS Terminal Forecast Quality Control. Vercelli and Leaphart, December 1987. (PB88-169925LL)
CP 88-1 AFOS Terminal Forecast Decoding. Vercelli and Leaphart, August 1988. (PB89-101240LL)
CP 89-1 Structure Flow Diagram Generator. Adams, March 1989. (PB89-195978AS)
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James F. Wantz

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AFOS TERMINAL AERODROME FORECAST ENCODING

James F. Wantz

1. INTRODUCTION

Most WSFO's prepare Terminal Forecasts (FT's) for domestic aviation and Terminal Aerodrome Forecasts (TAF's) for international flights. Because much of the information contained in FT's is also contained in TAF's, the forecaster must issue two forecasts for the same location and weather elements. To assist WSFO's in preparing TAF's, this application program, TAFENC, has been written to format a guidance TAF from an FT. The program also promotes consistency between FT's and the TAF's, as well as eliminating the necessity of writing two separate forecasts. It was initially released in 1987 (Wantz and Eggers 1987) and now accommodates the revised TAF format (NWS 1993).

It should be stressed that the product created by TAFENC is a guidance product and not the official forecast because of assumptions that the program must make. In addition, if the 0600 UTC TAF were produced from the 0100 UTC FT, the information used for the TAF would be 5 hours old, and the last FT sentence would need to be extrapolated for at least 6 hours to produce a full 24-h forecast.

2. METHODOLOGY AND SOFTWARE STRUCTURE

The TAF encoder consists of three separate programs: TAFENC, TAFGEN, and TAFBUL as shown in Fig. 1. The encoder must be used in conjunction with the FT decoder (Vercelli and Leaphart 1994b) or the FT quality control program FTQC (Vercelli and Leaphart 1994a). When TAFENC begins, it reads the optional command-line switches defined in Part B, and it looks for the existence of a file called FTQC.D1. If FTQC.D1 is present and it contains decoded FT's, the program reads a file called TAFSTA which contains the AFOS node identifier, ccc, and the 3-letter station identifier, xxx, of each station to be encoded into TAF's. The program then determines if FTQC.D1 holds decoded FT's for the stations specified in TAFSTA and if it does, it chains to TAFGEN which reads the contents of FTQC.D1 and uses the data to encode TAF's and to write the encoded TAF's to an RDOS file, cccTAFxxx.

If FTQC.D1 does not exist, TAFENC reads the AFOS product identifier subkeys from the TAFSTA file and retrieves FT's from the AFOS database for each of the indicated stations. TAFENC then calls the FT decoder program which decodes the FT. The information is written into a file called FTARR. The process is repeated until all of the decoded FT's are placed into the file FTARR. TAFENC at this point then chains to TAFGEN which uses the contents of FTARR to encode the TAF's and to write the encoded TAF's to an RDOS file, cccTAFxxx.

TAFGEN then chains to TAFBUL which reads cccTAFxxx, inserts carriage returns and indentations where required, then stores the output by sending it to the AFOS database as the product cccWRKTAF. All of the required TAF's are contained in this file. See Fig. 2 for an example of FT's and the TAF's encoded from them.

TAF's are issued at standard synoptic times (i.e. 0000, 0600, 1200, and 1800 UTC), whereas FT's (NWS 1994) are issued three times per day. Table 1 shows the issuance times by time zone. Both the FT's and TAF's are issued for 24-h periods, and the TAFENC program is designed to be run after an FT is issued.

Table 1. FT product issuance times in UTC during standard (daylight) time.

Time Zones			
Eastern	Central	Mountain	Pacific
0100 (0000)	0100 (0000)	0200 (0100)	0300 (0200)
0900 (0800)	0900 (0800)	1000 (0900)	1100 (1000)
1800 (1700)	1800 (1700)	1900 (1800)	2000 (1900)

3. PROCEDURES

Before executing TAFENC, the following files must be present on, or linked to, the master directory (SYSZ): TAFSTA, TAFENC.SV, TAFENC.OL, TAFGEN.SV, and TAFBUL.SV. If you have been running an earlier version of the TAF encoder, TAFSTA should already be on the disk and no modification is necessary. However, if you are running TAFENC for the first time, you will need to create this file.

The first step is to determine all of the TAF's issued by your office. Use an RDOS text editor to create the file named TAFSTA. Use the following format: cccxxx02cccxxx02 ... cccxxx09, where ccc represents the AFOS node identifier of the issuing WSFO and xxx the AFOS station identifier of the terminal for which you are making the forecast. The ASCII digits "02" functions as a separator and "09" functions as an end-of-file marker. If you produce a TAF for only one terminal, use the form cccxxx09.

Next, at the ADM type: RUN:TAFENC [/d][nnn/P][nn/T](ENTER). The items in square brackets are optional command-line switches (see Part B for an explanation of their meanings). When the job completes, the alarm/alert light will flash and the message "JOB TAFENC COMPLETED - PRODUCT cccWRKTAF STORED" will be displayed when the key is struck. If the FT decoder detects an error in an FT, the message "JOB TAFENC ABORTED - ERROR CONDITION: PROBLEM IN FT" will appear on the Dasher. When this occurs, the FT decoder error number (Vercelli and Leaphart 1994b) will be printed on the Dasher.

To determine the cause of this error, you can run the FT quality control program (FTQC) (Vercelli and Leaphart 1994b) to get an explanation of the error in the FT. When FTQC completes, the alarm/alert key will flash. Upon striking the alarm/alert key, the contents of the AFOS product CCCTAPERR will be displayed.

The software structure and load line for TAFENC are given in Fig. 3 and for TAFGEN in Fig. 4. TAFBUL is a main program which calls only utility subroutines. Its load line is shown in Fig. 5.

4. CAUTIONS

It is important to note that the TAF's produced by TAFENC should be considered to be guidance only. You should never transmit the TAF's produced by TAFENC before carefully reviewing them. As noted earlier, certain assumptions are made by TAFENC that may degrade the quality of the output TAF.

According to the Weather Service Operations Manual Chapter D-37 (NWS 1993), it is permissible for the forecaster to use multiple weather groups to describe the state of the weather during a given forecast period. The program at present will generally encode the TAF equivalent of the weather forecast in the FT. In some cases, it may be desirable to have only one weather group to describe your forecast. In these situations, you will have to edit the TAFENC output before you send the final TAF.

When running TAFENC on a regularly scheduled FT, it is recommended that you make sure that the FT time is before the scheduled time of the TAF. Otherwise it is possible for TAFENC to miss some time periods later in the forecast. Since you are required to issue TAF's prior to their valid times, you should not see this type of error.

5. REFERENCES

National Weather Service, 1993: International Aviation Aerodrome Forecasts. NWS Operations Manual Chapter D-37, Manual Issuance 93-7, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 36 pp.

_____, 1994: Aviation Terminal Forecasts. NWS Operations Manual Chapter D-21, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 44 pp.

Vercelli, D. J. and M. A. Leaphart, 1994a: AFOS Terminal Forecast Quality Control. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 94-X, National Weather Service, NOAA, U.S. Department of Commerce, 27 pp, (in preparation).

_____, 1994b: AFOS Terminal Forecast Decoding. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 94-X, National Weather Service, NOAA, U.S. Department of Commerce, 35 pp, (in preparation).

Wantz, J. F. and C. A. Eggers, 1987: AFOS Terminal Aerodrome Forecast Formatting. NOAA Techniques Development Laboratory Computer Program NWS TDL CP 87-1, National Weather Service, NOAA, U.S. Department of Commerce, 11 pp.

6. PROGRAM INFORMATION AND PROCEDURES FOR INSTALLATION AND EXECUTION

AFOS TERMINAL AERODROME FORECAST FORMATTING

PART A: PROGRAM INFORMATION and INSTALLATION PROCEDURE

PROGRAM NAME: TAFENC

AAL ID: DBC077
Revision No.: 5.00

FUNCTION: Encode TAF forecasts from official FT forecasts. The program is designed to run from the output of the FT decoder program (DCDFT) or from an input file called FTQC.D1.

PROGRAM INFORMATION:

Development Programmer(s):

James F. Wantz

Location: Techniques Development Laboratory

Phone: 301-713-0056

Maintenance Programmer(s):

James F. Wantz

Location: Techniques Development Laboratory

Phone: 301-713-0056

Language: FORTRAN IV/Rev 5.57
MAC Assembler/Rev 6.30

Save file creation dates: TAFENC.SV, TAFGEN.SV, and TAFBUL.SV
Release/Revision 5.00 - May 1994

Running time:

Less than 15 seconds per TAF forecast.

Disk space: Program files - 312 RDOS blocks
Data files - 6 RDOS blocks

PROGRAM REQUIREMENTS

Program files:

NAME

TAFENC.SV
TAFENC.OL
TAFGEN.SV
TAFBUL.SV

Data Files:

NAME	Disk location	READ/WRITE	COMMENTS
TAFSTA	Master directory	R	ID's of stations to be placed in TAF bulletin
cccTAFxxx	Master directory	R/W	TAF bulletin without carriage return-line feed (CRLF)
cccWRKTAF	Master directory	W	Bulletin with CRLF stored in data base
FTARR	Master directory	R/W	Decoded FT output

AFOS Products:

ID	ACTION	COMMENTS
cccWRKTAF	Stored	TAF bulletin derived from program TAFBUL

LOAD LINE

```
RLDR/A/P/E TAFENC TAFENC. LM/L URREV
TAFNIL ACOUNT CLDS DCDFT DCDGRP DUBWX INITAR IUANDEC
NXTWRD PERBLAN POUT WXCHKR DATB TIMADJ DCDWX
JUANDEC SEARCH SLARG KOUNT WMOV OBVISCK
[FTCOMP CATCW AMD CATPHR CKDLAU CKINDNT CONLINE CATDCD
DLAD DDSHEH DFTYPE FINDGRPS FINDSCL POSFIND SPLTWX COMPCAT
FNLCHK FNL1 FNL2 FNL3 FNL4 FNL5 FNL6 FNL7 FNL8 FNL9 FNL10 FNL11
CDVSSPWX CHC CPYPRV DRVWW FRONTAL GTCLDS
LLWS NEWPH OBWX OCNL PHRCLD REMARKS SLGTCHC SPWCHKR SPWIND
TQCHKR VBWXWD VCNTY VSBLTY WNDTQ WIND]
<BG UTIL FORT TOP>.LB

RLDR/A/P/E TAFGEN TAFHDR TIMADJ TAFTIM TAFREM TAFTMR TAFVIS
TAFWEA TAFNSW TAFCLD TAFCAT DATB TAFWND
INITAR CONVERT URREV UTIL.LB FORT.LB TAFGEN.LM/L

RLDR/P/E TAFBUL TAFBUL/S 20/C TAFBUL. LM/L INITAR URREV
<BG UTIL TOP FORT SYS>.LB
```

PROGRAM INSTALLATION

1. List the contents of the supplied floppy disk and make sure the following files are present: TAFENC.SV, TAFENC.OL, TAFBUL.SV, TAFGEN.SV, and TAFINSTALL.MC.

2. TAFSTA must be created by the user. See the procedures section.

3. If all of the above files are present, at the ADM type: RUN:DP#: TAFINSTALL (where # refers to the floppy drive number) and hit [ENTER], or at the Dasher type: DIR DP#[RETURN]. Then type: TAFINSTALL [RETURN].

4. The TAFINSTALL macro will move the program files onto your master directory. If the "FILE SPACE EXHAUSTED" error prints during the execution of TAFINSTALL, it will be necessary to delete or move some files before running TAFINSTALL.MC again.

AFOS TERMINAL AERODROME FORECAST FORMATTING

PART B: PROGRAM EXECUTION and ERROR CONDITIONS

PROGRAM NAME: TAFENC

AAL ID: DBCO77
Revision No.: 5.00

PROGRAM EXECUTION

1. Add the product cccWRKTAF to your wish list or database. The ccc represents your WSFO ID.

2. From the ADM type: RUN:TAFENC [ENTER].

3. When the program has completed, the alarm/alert light at your console should flash. Pressing the alarm/alert button displays the message "JOB TAFENC COMPLETED: PRODUCT cccWRKTAF STORED."

4. In order to display the product just created, type: cccWRKTAF [ENTER].

5. Definitions of switches:

ERROR CONDITIONS

ON THE DASHER:

1.	OPEN ERROR FILE: TAFSTA!	TAFSTA file is missing
2.	CHAINING ERROR:	TAFBUL.SV and/or TAFBUL.SV are missing
3.	INVALID WEATHER GROUP FOUND!	FT decoding error
4.	FROM TAFWND: BAD WIND DIRECTION SUPPLIED.	FT decoding error
5.	AN ILLEGAL VALUE FOR CLOUD HEIGHTS FOUND.	FT decoding error
6.	WARNING: THIS BULLETIN EXCEEDS 1,800 CHARACTERS.	TAF bulletin is longer than the 1,800 characters permitted by international agreement. Any information after 1,800 characters will be lost.

In case the output from this program is faulty, it is possible to run the program with a /P switch. This switch enables the printing of diagnostic messages from various subroutines within the FT decoder portion of the program. The diagnostics will be typed on the Dasher. The general form of the command would be RUN:TAFENC #/P, where # symbolizes the diagnostics number. The diagnostics number will determine what messages are printed from the FT decoder subroutines.

When first executed, TAFENC first looks for the file FTQC.D1 which is generated by the FTQC program. To delete the FTQC.D1 file upon completion of the TAF Encode, run it as TAFENC/D. This will avoid complications upon the next run of the TAF encoder.

Because the TAF encoder outputs to a work file, it is necessary to run a program like ALEMBIC to split the work file into individual products. ALEMBIC uses the vertical bar character to determine where to split the work file. The "/V" switch informs TAFENC to insert a vertical bar "|" character before each four-character International Civil Aviation Organization (ICAO) identifier. At the ADM type: RUN:TAFENC/V.

The program has the capability to format TAF messages from either routine or amended FT's and to format TAF amendments from routine or amended FT's. This is controlled by the user with the "T" switch at the command line.

To encode a routine TAF from an amended FT, you type at the ADM: RUN:TAFENC #/T. The # represents one of the 4 synoptic times given to the nearest hour. This number forces the TAF encoder to begin encoding the TAF at the specified time. The four valid synoptic values for # are: 00, 06, 12, and 18Z. To encode an amended TAF from a routine FT type: RUN:TAFENC 50/T. The constant 50 in the data field of the switch tells the program to produce the amended TAF from the routine FT.

If the user does not enter a switch, the program will encode a routine TAF for a routine FT or an amended TAF from an amended FT. These are the two default situations.

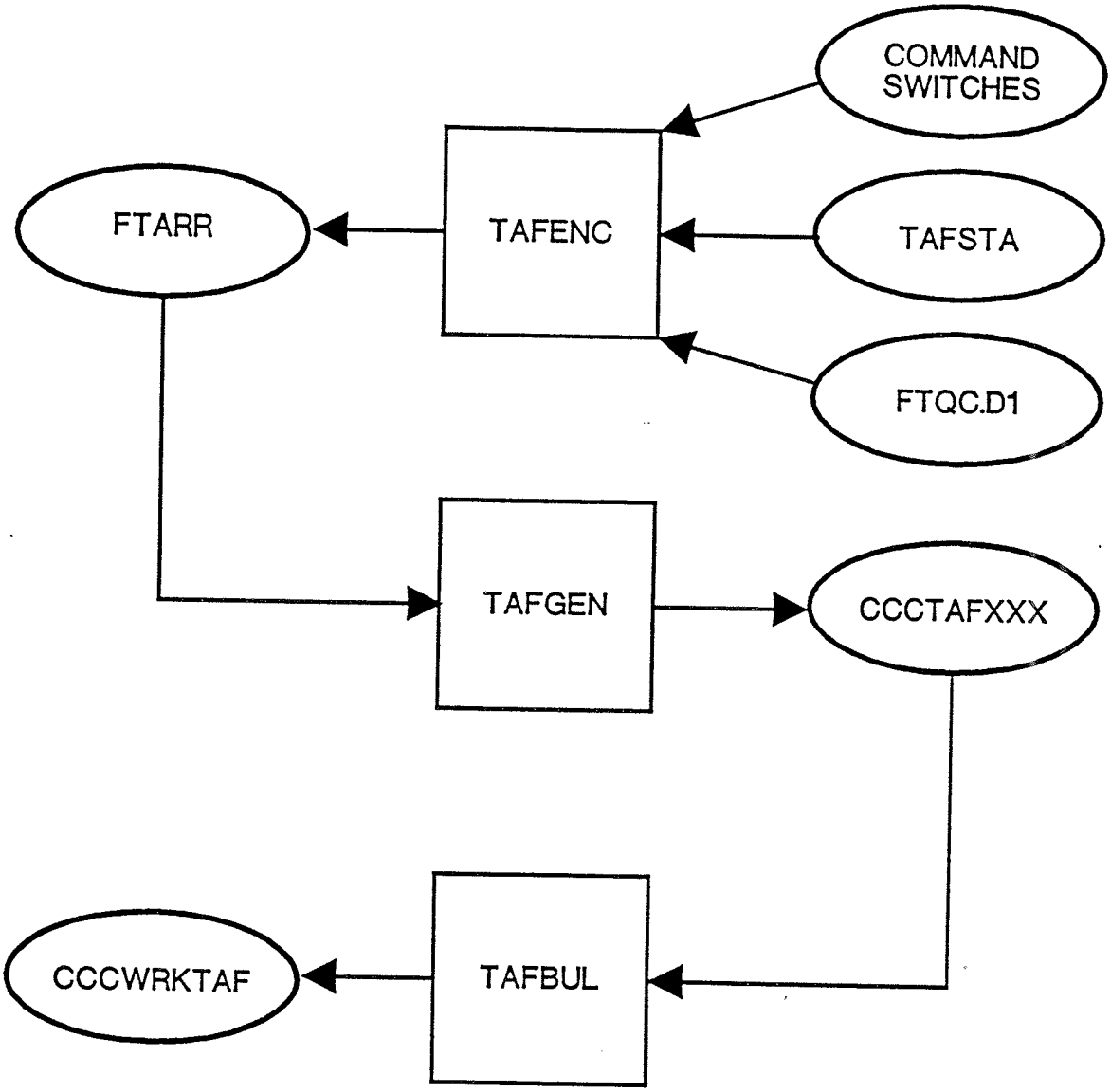


Figure 1. Overview of the TAF formatting program.

```
ZCZC TDLWRKFTA
TTAA00 KTDL 061306
|OKC FT 060909 C8 OVC 5R- 3316G23 OCNL C3 OVC 3R-F.
    22Z C50 OVC.
    03Z C50 OVC 1R-F..
|DFW FT AMD 061209 1214Z 30 SCT C50 OVC 1012 OCNL C30 OVC 3R-F.
    18Z C20 BKN 30 OVC 4R-F 0910 OCNL C10 OVC 1TRWF.
    03Z C8 OVC 2TRW..
|MSP FT 060909 C5 OVC 4F 3614 OCNL C10 OVC 5H.
    12Z C10 OVC 5F 0211 OCNL 4RW-.
    16Z C5 OVC 3F.
    19Z C3 X 1F.
    03Z 3 SCT C7 BKN 2F.
    07Z C20 OVC..
|ORD FT AMD 061108 1106Z 20 SCT 250 SCT 2118G28 OCNL C20 BKN.
    17Z 250 SCT 2314G23 CHC C60 BKN 5TRW..
|IAD FT 060909 C3 OVC 3R-F 3514 OCNL 3 SCT C8 OVC 5F.
    17Z C5 BKN 11 OVC 3614 OCNL 5 SCT C11 OVC CHC 3ZR-/IP-F.
    21Z C10 OVC 2S-F 0410 OCNL C8 X 1/2S CHC C3 X 1/4S+.
    03Z C15 OVC 2S-F..


ZCZC OKCWRKTAF
TTAA00 KOKC 061000
TAF
KOKC 061354Z 1212 33016G23KT 5SM -RA OVC008 TEMPO 1222 3SM -RA BR
     OVC003 BECMG 2122 00000KT P6SM NSW OVC050 BECMG 0203 1SM -RA
     BR=
KDFW 061354Z 1212 10012KT P6SM SCT030 OVC050 TEMPO 1218 3SM -RA
     BR OVC030 BECMG 1718 09010KT 4SM -RA BR BKN020 OVC030 TEMPO
     1803 1SM TSRA BR OVC010CB BECMG 0203 00000KT 2SM TSRA OVC008CB=
KMSP 061354Z 1212 02011KT 5SM BR OVC010 TEMPO 1216 4SM -SHRA
     BECMG 1516 00000KT 3SM BR OVC005 BECMG 1819 1SM BR VV003 BECMG
     0203 2SM BR SCT003 BKN007 BECMG 0607 P6SM NSW OVC020=
KORD 061354Z 1212 21018G28KT P6SM SCT020 SCT250 TEMPO 1217
     BKN020 BECMG 1617 23014G23KT SCT250 PROB40 1708 5SM TSRA
     BKN060CB=
KIAD 061354Z 1212 35014KT 3SM -RA BR OVC003 TEMPO 1217 5SM BR
     SCT003 OVC008 BECMG 1617 36014KT P6SM NSW BKN005 OVC011 TEMPO
     1721 SCT005 OVC011 PROB40 1721 3SM -FZRAPE BR BECMG 2021
     04010KT 2SM -SN BR OVC010 TEMPO 2103 1/2SM SN VV008 PROB40 2103
     1/4SM +SN VV003 BECMG 0203 00000KT OVC015=
```

Figure 2. Sample FT's and corresponding TAF's

TAFENC

MAIN PROGRAM
TAFENC

SUBROUTINES
DCDFT

LOAD LINE
RLDR TAFENC TAFNIL ACOUNT CLDS DCDFT DCDGRP DUBWX INITAR IUANDEC NXTWRD PERBLAN POUT WXCHKR DATB TIMADJ DCDWX JUANDEC SEARCH SLARG KOUNT WMOV OBVISCK [FTCOMP CATCW AMD CATPHR CKDLAU CKINDNT CONLINE CATDCD DLAD DDSHEH DFTYPE FINDGRPS FINDSCL POSFIND SPLTWX COMPCAT FNLCHK FNL1 FNL2 FNL3 FNL4 FNL5 FNL6 FNL7 FNL8 FNL9 FNL10 FNL11 CDVSSPWX CHC CPYPRV DRVWW FRONTAL GTCLDS LLWS NEWPH OBWX OCNL PHRCLD REMARKS SLGTCHC SPWCHKR SPWIND TQCHKR VBWXWD VCNTY VSBLTY WNDTQ WIND] BG.LB UTIL.LB FORT.LB TOP.LB

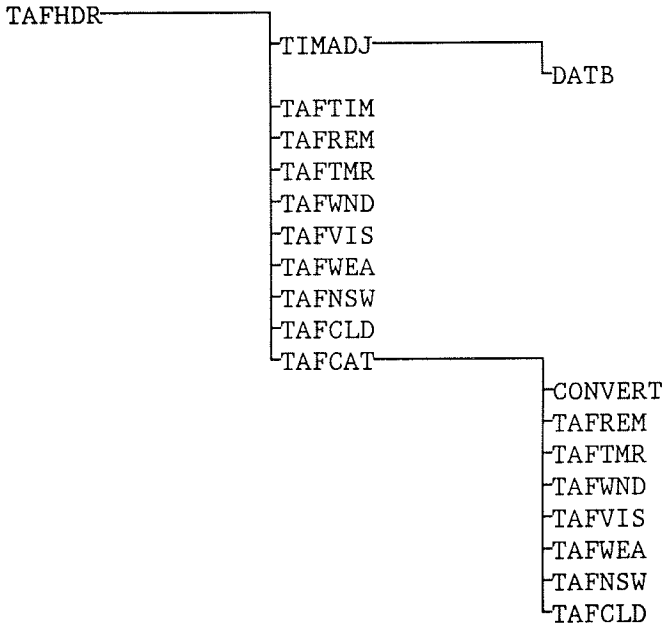
Figure 3. Software structure and load line for program TAFENC.

TAFGEN

MAIN PROGRAM

TAFGEN

SUBROUTINE



LOAD LINE

RLDR TAFGEN TAFHDR TIMADJ TAFTIM TAFREM TAFTMR TAFVIS TAFWEA TAFNSW TAFCLD TAFCAT DATB TAFWND INITAR CONVERT URREV UTIL.LB FORT.LB

Figure 4. Software structure and load line for program TAFGEN

TAFBUL

MAIN PROGRAM

TAFBUL

SUBROUTINES

None

LOAD LINE

RLDR TAFBUL INITAR URREV BG.LB UTIL.LB TOP.LB FORT.LB SYS.LB

Figure 5. Software structure and load line for program TAFBUL.

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Computer Program NWS TDL

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CP 93-1 AFOS Profiler Software System. Battel, Leaphart, Moeller, and Petrie, August 1993. (PB94-112711)

CP 93-2 AFOS Surface Observation Decoding. Beasley, September 1993. (PB94-112042)

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CP 93-6 NOAA Weather Radio Climatological Data Reports. Calkins and Battel, December 1993. (PB94-143252)

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